

Support of Cancer Research by the American Cancer Society

Harry M. Weaver .

*American Cancer Society, Inc.
New York City*

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*American Cancer Society, Inc.
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THE SUPPORT OF research in the medical, biological and related physical sciences has grown to mammoth proportions since the close of World War II; and this rapid growth has engendered serious problems for educational institutions and individual scientists alike. Few areas, if any, have grown faster than the support of cancer research through extramural grants.

In 1954, the Board of Directors of the American Cancer Society—acutely aware of the tremendous growth of the Society's own research program from approximately \$1 million in 1945 to a projected expenditure of nearly \$7 million in 1955, and of the continuing development with time of an ever more stimulating climate and greater opportunities for productive research on the cancer problem—elected to take a fresh look at the effectiveness of its own policies, procedures and practices related to research. Accordingly an Ad Hoc Research Policy Survey Committee* was appointed early in 1955 and charged with reviewing and evaluating the Society's existing research policies, procedures and practices and its scientific evaluative and administrative machinery for research; and to recommend any changes considered to be desirable.

*The American Cancer Society is deeply grateful for the imaginative and useful work of this committee composed of Dr. Lowell T. Coggeshall, University of Chicago, chairman; James S. Adams, Lazard Freres and Company, New York City; Dr. George W. Beadle, California Institute of Technology; Dr. R. Keith Cannan, National Research Council; David Crockett, Massachusetts General Hospital; Rutherford L. Ellis, Lipscomb-Ellis Company, Atlanta; Dr. Sidney Farber, Children's Cancer Research Foundation, Boston; Charles D. Hilles, Jr., International Telephone and Telegraph Corporation, New York City; Dr. Leon O. Jacobson, University of Chicago; Donald E. Johnson, Flint, Michigan *News-Advertiser*; Mrs. Albert D. Lasker, Albert and Mary Lasker Foundation, New York City; Dr. Ian Macdonald, University of Southern California; Dr. Randolph T. Major, Merck and Company, Rahway, N. J.; Basil O'Connor, National Foundation for Infantile Paralysis; Dr. Eugene P. Pendergrass, University of Pennsylvania; Dr. Charles W. Shilling, Atomic Energy Commission; Dr. Howard C. Taylor Jr., Columbia University; Dr. Thomas B. Turner, Johns Hopkins University; Dr. Paul D. White, Harvard University; Dr. G. E. W. Wolstenholme, The Ciba Foundation, London and Dr. David A. Wood, University of California.

The committee was advised that there was no compelling reason to retain any part of the Society's then existing policies, practices, procedures or scientific evaluative or administrative machinery for research unless it could be shown to serve a maximally useful purpose.

The committee initiated its study by accepting the following tenets as a basis for further discussion:

1. The *sine qua non* of productive research is a good idea, and ideas are peculiarly the intellectual property of imaginative and well-trained persons. The committee then asked itself the question, "Are the best minds being encouraged to enter cancer research, and once in the field, do such persons find positions that are conducive to a maximally productive career?" The answer being partly in the negative, the committee then asked itself the further question, "What can the American Cancer Society do to satisfy better this important prerequisite to productive research?"

2. Productive research on the cancer problem is a highly individualistic enterprise; and the form and conditions of the grant must meet the unique needs of the research that is recommended for support by a competent body of scientific advisors, not vice versa. The committee then asked itself the question, "Do the Society's policies and administrative machinery for research, and the form and conditions of its grants, adequately meet the unique needs of productive research on cancer?" The answer to this question being partly in the negative, the committee then asked itself the further question, "What must the Society do to meet these needs more adequately?"

The Ad Hoc Research Policy Survey Committee concluded its work early in 1956 by submitting the attached report on its challenging assignment. This report contains ample evidence that the Ad Hoc Research Policy Survey Committee "has taken a refreshingly realistic look at the requirements for successful scientific exploration."¹ Although this plan for the sponsorship of research through extramural grants was designed specifically for the American Cancer Society, it is equally applicable to research having different objectives. Therefore, it should be of more than passing interest to administrators, educators and investigators in general.

As this report is published verbatim, it is cast entirely in terms of recommendations. Therefore, it should be pointed out that the report as a whole and all of the contained recommendations have been adopted officially by the American Cancer Society. The recommendations for change are now in the process of being implemented.

As the reader will note, a considerable part of the report is devoted to a discussion of the philosophy and needs of productive research, and to the forms of extramural grants that are needed to meet the unique requirements of imaginative and productive research on the cancer problem. The report describes *in extenso* four types of grants for the support of research *per se*—project grants, program grants, institutional research grants and contracts for research—and also four forms of grants for the training and support of investigators—undergraduate science scholarships, postdoctoral fellowships, grants for scholars in cancer research and grants for additional faculty level positions for scientific investigators. It is believed that the

American Cancer Society will be able to find among the different types of grants described a proper mechanism for encouraging maximal imagination and productivity in connection with any research that might be recommended for support by a competent body of scientific advisors.

The report concludes with a description of the administrative machinery required for operation of the recommended program of research grants. It will be noted that the recommendations call for a closer liaison (to be effected by staff) between scientists, institutions for higher learning, scientific advisory committees and the fund-granting agency, and a mechanism for scientific evaluation of proposals for research that is both unified and simplified. This machinery should make for more complete understanding of the problems of all parties concerned, and also assure competent screening of applications for research grants by qualified scientific advisory committees.

Finally, the Ad Hoc Research Policy Survey Committee recommended continued study, by a different committee, of the crucial problems of adequate financing of improved training and of the pursuit of knowledge for its own sake in the fields of medicine, biology and the related physical sciences. The present status of this development will be described under the heading "Report of committee on support of basic research and of medical and educational centers."

Report of Ad Hoc Research Policy Survey Committee

Part A: Forms of Grants

*(As presented to and approved by the Society's
Research Committee on December 7, 1955 and the Executive
Committee of the Society's Board of Directors on December 8, 1955)*

FOR RESEARCH

THE FOLLOWING RECOMMENDATIONS are made on the assumption that, if research on cancer is to be truly imaginative and fully productive, the procedures for requesting and making a grant—and the rules, regulations, and form of the grant—must meet the unique requirements of the research proposed, and not vice versa. Obviously these requirements differ with the nature, extent and objectives of the intended research. It is believed that these needs vary to such an extent that more than one form of grant is required. Therefore, it is recommended that the American Cancer Society consider making grants of the following types with the understanding that the procedures which follow are meant to serve only as guidelines or principles for building an effective administrative mechanism for supporting research:

Project grants

Project grants may be defined as the award of a specific sum of money, made available to an institution for a limited period of time, to assist in defraying the cost of conducting research directed to solving, with a predetermined plan, a particular problem in a specified area related to cancer. Normally, project grants are to support research limited in time and scope under the direction of a specified investigator(s), and are effected through annual grants which may be renewed upon application. However, when appropriate, these grants may be made for a longer period of time.

Project grants may be employed to support that type of research which can be pursued with an established set of principles and in which it is possible to outline with some precision the experimental design and to estimate the time required to complete the study. A definite answer of some sort can be anticipated in most cases. This type of grant may be used also to support the work of mature investigators or the research of young investigators who have not yet had time and/or opportunity to demonstrate their scientific competence and capacity for productiveness in a particular field of research.

Project grants should be viewed as grants-in-aid. By this it is meant that project grants are not intended to defray the total costs of the research proposed, but only to help institutions support that type of research which they would underwrite entirely if they had sufficient of their own funds to do so. The grantee institution is expected to provide the salaries of the responsible investigators who hold tenure or occupy senior faculty or staff status, the required physical facilities and basic equipment, and the usual library, purchasing, accounting and other administrative services that are normally available in an institution qualified to conduct research on cancer. The purpose of a project grant is to provide the extra money to defray the costs of the additional personnel, equipment, supplies, materials, etc., that are needed to conduct a particular scientific investigation but which are not attainable through funds of the institution.

To help grantee institutions meet the sizeable indirect costs to be incurred in conducting research for which many project grants are being made, it is recommended that the amount of the grant (a sum equal to the direct costs noted above) be increased by 15 per cent. It is further suggested that the institution not be required to submit a detailed accounting of expenditures for items of indirect costs, but instead be permitted to take from the total grant a sum not to exceed 15 per cent of acceptable expenditures.

The proposed budget for a project grant should be viewed as a realistic estimate of the funds required. Therefore, if a lesser amount is needed to conduct the research within the effective period of the grant, all unexpended monies should revert to the grantor. Conversely if a greater amount of money is required within the term of the grant, the grantee should expect to receive from the grantor a most sympathetic hearing for a request for additional funds.

An application for a project grant should delineate clearly the objectives and plan for the research. Obviously, the plan must be based on the pertinent knowledge available at the moment it is formulated. Therefore, a substantial change in this knowledge might render inappropriate the plan of attack originally proposed. Should this occur, or if for other reasons the responsible investigator elects to abandon the initial objectives for research, he should be expected to report the circumstances to the grantor.

Program grants

There is an urgent need for an administrative mechanism to allow for the financial support of scientific explorations that must of necessity probe many alleys, employ to varying degrees the techniques and procedures of different scientific disciplines, proceed in directions that may not always be fashionable—and that even may be halted from time to time to develop and standardize new apparatus and techniques—in a continuing effort to spawn new and significant knowledge. Program research relates to freely-roaming inquiries into specific areas that have been judged to be of signifi-

cance to the cancer problem and that tend to fall into broader categories of research where the methodology is not clearly indicated or the problem to be solved cannot be framed in so precise experimental terms.

Such research, if it is to be maximally fruitful, especially needs an imaginative and experienced investigator with time and freedom to explore in any direction that his imagination suggests and to employ funds accordingly. For this type of research, continuity of support is essential.

Program research must be assured of continuity of support, else there will be few attempts to explore avenues of research that might not quickly yield results of sufficient import to assure favorable consideration of subsequent applications for annual grants. Moreover, since time is one of a scientist's most treasured possessions, he will seldom undertake to explore relatively new areas unless support is assured for a sufficient length of time to allow him to compensate for the period of nonproductivity that invariably accompanies initiation of new research. In addition, unless some reasonable continuity of support is assured, the investigator will not undertake to train, nor will he be able to hold, the needed professional and technical assistants. Finally, program research, if it is to be fully productive, may require that one or more additional senior investigators be employed. Competent investigators, with the special skills and abilities required, can seldom be obtained without assurance of salary for more than one year.

In freely-roaming inquiries of the type under discussion, the scientist is usually able to define rather precisely his area of major interest. He is able to state his long-term objectives in fairly general terms. He can usually define with fair precision, for about one year in advance, the nature and extent of the experiments he plans to carry out. But, he is quite unable to predict the nature and extent of the experiments he will need to conduct during the second and subsequent years of the investigation; for these are determined by the sum total of knowledge available at the moment such experiments are planned. Hence, in freely-roaming inquiries, the scientist is able to determine for only about one year in advance his requirements for materials, supplies, equipment and personnel (except for senior investigators, for whom long-term salary commitments must be made beforehand).

Thus, his financial needs for the second and subsequent years will depend upon the experimentation that can and should then be undertaken; this in turn will depend upon what the investigator, and other scientists, have been able to accomplish meantime. And, if the investigator is to pursue his original (or possibly changing) objectives with the best of the new instruments and techniques as they become available, one should expect that the cost of conducting the research will change from year to year.

Therefore, it is recommended that program (or freely-roaming) research be supported by grants of two types, given as a unit. Part of the grant should insure funds with which the grantee institution can, if necessary, make long-term salary commitments (for some three to five years in advance). The other part of the grant should defray, for one year in advance, those remaining costs of the research such as equipment, supplies, materials and other personnel.

The form of the grant to support program research will depend on whether or not additional scientists (reasonably seasoned investigators with M.D. or Ph.D. degrees, or both) are needed. If not, long-term support for salaries is not required. However, if one or more investigators are needed in addition to those already employed by the grantee institution, a long-term grant is required to enable the institution to make salary commitments to these additional investigators for however long salaries must be assured (up to a maximum of five years).

In the long-term grant the agency agrees to pay to the grantee institution each year, for the duration of the grant, the amount of the predetermined salaries of those additional investigators specifically named in the grant.

Whereas it is the intent of the grantor to continue to support the program of research to a logical conclusion, the remaining costs of the research might best be provided through annual grants. But, to assure reasonable continuity of support, it is recommended that the investigator responsible for the study be informed that such support will not be terminated without one year's prior notice in writing. Should such notice of intent to terminate be given, the support during the ensuing 12 months might normally be expected to be the amount of the annual support at the time of notification, or the amount of support that already has been requested for the following year, whichever is less.

The fund-granting agency might properly refuse to make program grants until it has been convinced that: (a) The scientific investigators are workers of proven competence, with an established record of productiveness and with time and capacity for creative imagination; (b) The investigation will be pursued in an aggressive fashion and at a reasonable cost; and (c) Exploration of the area of research by the particular investigators and method of attack proposed might reasonably be expected to yield knowledge of considerable interest to the agency.

In program grants, hope for success is based primarily on the capacity of an investigator to uncover worthwhile information as the result of freely-roaming inquiry within a general area of research. Therefore, the investigator must have freedom to change the direction and emphasis of his investigation as indicated. Among other things, this means that applications for program grants should be acceptable even though couched in rather general terms, and that the investigator must be allowed considerable latitude in expending funds.

As in the case of project grants, program grants should be viewed as grants-in-aid, in that they are intended only to help institutions support that quality of research which they would underwrite entirely if they had sufficient of their own funds to do so. It is expected that the grantee institution will provide the salaries of the principal investigators (except for those additional senior investigators specifically employed on a long-term basis for the research in question), the required physical facilities and basic equipment, and the usual library, purchasing, accounting and other administrative services that are normally available in an institution qualified to conduct research on cancer. The program grant is to provide the extra money

to defray the costs of the additional personnel, equipment, supplies, materials, etc., that are needed to conduct the particular program of research but which are not attainable through funds of the institution.

To help grantee institutions meet the sizeable indirect costs to be incurred in conducting research for which many extramural grants are made, it is recommended that the total amount of the grant be increased by 15 per cent. It is further suggested that the institution not be required to submit a detailed accounting of expenditures for items of indirect cost, but instead be permitted to take from the total grant a sum not to exceed 15 per cent of acceptable expenditures.

The proposed budget for a program grant should be viewed as a realistic estimate of the funds required. Therefore, if a lesser amount is needed within the period of the grant, all unexpended funds should revert to the grantor. Conversely, if a greater amount of money is required within the term of the grant, the grantee should expect to receive from the grantor a most sympathetic hearing for a request for additional funds.

Institutional research grants

Institutional research grants are allocations to qualified institutions to foster research—beyond that possible by project or program grants—directed towards elucidating the causes and developing methods for the control of cancer in man. Institutional research grants are intended to provide funds both to stimulate the integration of effort in a given field at the intramural level, to support immediately the preliminary testing of new venturesome ideas for cancer research, and to implement quickly other research on cancer that cannot be expedited effectively by the usual type of extramural grant.

It is believed that institutional research grants have played an important part in raising to its present high level the nationwide program of research on cancer. Such grants have served many important functions. For example, they have enabled institutions to partially remedy certain inherent deficiencies in the grant-in-aid program. They have served to counterbalance the possible adverse effect of too much central influence on the nature of cancer research that is likely to receive support through extramural grants. Moreover, institutional research grants have provided "grub-stakes" to support the preliminary testing of a variety of new ideas. Finally, these grants have encouraged some investigators to work on cancer who might otherwise not have, and they have enabled institutions for higher learning to demonstrate anew the value of their active participation in research.

An institutional research grant should require the establishment within the grantee institution of a committee to be charged both with controlling expenditures from the grant, and with stimulating the institution to achieve a greater measure of its maximum potential for truly imaginative and fully productive research on cancer. It is believed that, through a grant which is controlled and operated within the administrative framework of the institution, it is possible to engender a unique interdisciplinary and interdepartmental attack on cancer that can neither be initiated nor sustained by the other types of extramural grants.

But, whereas grants of the project and program types, as compared with institutional research grants, each have certain inherent advantages, neither appears to be totally satisfactory if used alone. It seems that these methods of supporting cancer research are mutually complementary and supplementary. Therefore an important decision is—what constitutes a proper balance between these two different types of grants?

It is believed that some venture capital can be used to good advantage by most institutions conducting research on cancer, irrespective of the size and extent of their current research activities related to this disease. However, the capacity to use funds effectively to assist and expedite going scientific investigations is limited to those institutions where relatively large and active programs of research on cancer are actually under way.

It is manifestly desirable that all investigations supported by funds of the American Cancer Society be of the highest quality, and conducted at a reasonable cost and in accordance with the best traditions of scientific research. To assure achieving these ends, some objective measure of relative quality and need of grantee institutions is required for use in determining the amount of each institutional research grant; this determination is made more difficult by the fact that it is impossible to ascertain in advance the financial requirements of the cancer research that might best be supported by an institutional research grant.

It is recommended that each local Institutional Research Grant Committee be encouraged to expend the funds of the grant only to support those worthwhile projects that cannot be supported adequately by the standard types of grants. The committee should be stimulated also to "wean" investigators promptly from institutional research grant support, so as to keep the funds of the grant sufficiently fluid to enable the institution to mount a truly effective program of cancer research.

It should be the policy of the American Cancer Society, in making an institutional research grant, to express its confidence in the grantee institution, and, therefore, not demand that an application for a grant include a proposed budget of expenditures. Rather, the institution should be advised as to how the funds of the grant cannot be expended (e.g., not for bricks and mortar or for alterations of buildings). Except for such specific prohibitions, the institution should have the right to expend the funds of the institutional research grant in any way it deems best to further productive research on cancer. Finally, it is suggested that the grantee institution be required to report only at the end of the year on expenditures made and results achieved, and that the report be functional in nature—i.e., oriented to the funds expended to support particular research activities—rather than being just a compilation of items purchased and salaries paid. This report would serve as the basis for making institutional research grants in subsequent years.

It is suggested that, as in the case of project and program grants, institutional research grants be viewed as grants-in-aid, in that they are intended only to help institutions support that type of research which they would underwrite entirely if they had sufficient of their own funds to do so. It

is expected that the grantee institution will provide the salaries of the principal investigators (who are regular members of the institution's staff), the required physical facilities and basic equipment, and the usual library, purchasing, accounting and other administrative services that are normally available in an institution qualified to conduct research on cancer. The institutional research grant is to provide the extra funds to defray the costs of the additional personnel, equipment, supplies, materials, etc., that are required to conduct the desired research but which are not attainable through funds of the institution.

To help the grantee institution meet the sizeable indirect costs to be incurred in conducting the research for which the institutional research grant is made, it is recommended that the amount of the grant be increased by 15 per cent. It is suggested further that the institution not be required to submit a detailed accounting of expenditures for items of indirect cost, but instead be permitted to take from the total grant a sum not to exceed 15 per cent of acceptable expenditures.

The amount of an institutional research grant should be viewed as the maximum sum available for the fiscal year beginning with the effective date of the grant. It is suggested that despite the local Institutional Research Grant Committee being allowed to commit funds—up to the total amount of the institutional research grant—for as long as one year in advance, it be encouraged to keep the grant sufficiently fluid to permit taking full advantage of day-by-day developments and to achieve a fully imaginative and productive program of research on cancer. Moreover, it is recommended that, while all uncommitted funds should revert to the grantor at the termination of the grant, the grantee be permitted to retain any committed funds up to 12 months after expiration of the grant. Finally it is recommended that the amount of each institutional research grant be increased or decreased only slowly and with caution, but that non-recurring supplemental awards be given from time to time to defray the cost of such items as equipment, etc.

Contracts for research

There may develop from time to time, in the total research effort against cancer, the need to implement such definitive work as: routine chemotherapy screening, the preparation in quantity of certain drugs or chemicals, the development and standardization of a particular apparatus, etc. Such work is more nearly one of development or of production than of research, and it represents the type of activity that is not routinely performed by our institutions for higher learning. Moreover, the financial requirements for such work usually can be determined in advance more precisely than can be done for research. Therefore, it is recommended that the Society develop a mechanism whereby it can enter into a contractual relationship, when indicated, with a suitable institution or organization, to bring about the completion of a particular job of work of the type noted above.

It is suggested that for many such contracts, the Society justifiably might be expected to defray the total cost of conducting the work for which the

contract is made. This would require funds to defray not only the out-of-pocket costs for the required personnel, equipment, supplies and materials, but also funds to defray the total indirect costs of the undertaking. The amount of the latter should be determined through negotiations between the contractors; using as a basis for further discussion, the usual practices of the grantee institution.

The duration of a contract should be governed by the nature and unique requirements of the job of work to be accomplished.

The budget for a contract for research should be viewed as an honest estimate of the funds required. Therefore, if a lesser amount is needed to complete the work within the period of the contract, the unexpended portion should revert to the grantor. Conversely, if a greater sum of money is required within the term of the contract, the grantee should feel free to request additional funds.

FOR INVESTIGATORS

In 1946, when relatively large sums of money first became available to support a comprehensive and nationwide program of research against cancer, it quickly became apparent that there was a paucity of scientists trying to discover some practical means to control this malady. Many influences contributed to this relative disinterest in cancer research, but the most important determinant was that only a handful of scientists had been able to obtain adequate sums of money to prosecute imaginative and purposeful investigations pertinent to this disease. As a direct consequence of the relative lack of funds to support cancer research, capable students and competent scientists tended to direct their energies into other pursuits. Thus, cancer research was impeded not only by a shortage of scientists to conduct the research of that time, but also by the lack of incentives adequate to entice students into this field and by a paucity of seasoned workers to train the additional investigators that would be needed in the future.

During the past 10 years, we have witnessed a tremendous expansion in the financial support of scientific research on cancer. As a consequence of this growth, it has become progressively more easy for scientists to obtain financial backing for investigative work pertinent to this malady. Nevertheless, and partly because most of this money has been awarded to support specific research projects on a short-term basis, we have as yet failed to satisfy the unique needs of the investigators who must conceive the ideas for and conduct the research that is requisite to a practical means for control of cancer in man.

The following recommendations to the American Cancer Society are based on the assumption that : (1) worthwhile ideas are the most important prerequisite to truly imaginative and fully productive research on cancer, (2) worthwhile ideas for research on cancer are most likely to issue from well-trained persons working in suitably equipped and expectant research environments, and (3) if the best of the available minds are to be both enticed into cancer research and thereafter encouraged to become fully productive, there must be an increase in the number of suitable, permanent

and full-time positions which afford competent and aggressive investigators environments that are conducive to creative imagination and which provide the physical facilities and those other requisites for conducting productive research.

• • •

The manifold problems connected with obtaining and maintaining adequate numbers of properly trained persons to assure a maximally productive program of research against cancer may be considered in relation to the following periods in the life of a scientist: (1) the undergraduate period, (2) the predoctoral period, and (3) the postdoctoral period.

The Undergraduate Period. The undergraduate period relates to the primary, secondary and collegiate training which ordinarily culminates with the award of an A.B. degree, or its equivalent.

The committee noted with grave concern the marked and continuing decline in the number of students who elect to major in the natural sciences at the undergraduate level, and in the relative number of qualified students who fail to undertake and complete college training. It is believed that a continuation of this trend will result ultimately in a lesser number of properly trained scientists and in a substantially less productive program of research on cancer than at present. Therefore, despite the American Cancer Society not being the agency of choice to attempt by itself to bring about a reversal of this undesirable trend, the committee recommends that the Society make known its concern and that it devote some of its resources to reversing the growing disinterest on the part of students in undertaking training in the natural sciences.

It is recommended further that the American Cancer Society both encourage and actively assist other more qualified organizations to develop and implement practical means for increasing the number of students who elect to undertake training in the natural sciences at the secondary school and collegiate levels.

Undergraduate science scholarship grants

Finally, it is recommended that the American Cancer Society, through both its national office and its divisions, offer scholarships to encourage deserving and qualified students, who would not otherwise do so, to enter college for the purpose of majoring in science. It is suggested that a committee consisting of representatives from both the divisions and the national office be appointed to work out a practical plan for effecting this recommendation.

In general, it is suggested that:

- (a) scholarships be limited to well qualified students with a demonstrated aptitude for science and who show such financial need that they would not otherwise enroll in college;
- (b) the monetary value of such scholarships be approximately \$2,000 per student, payable at the rate of approximately \$500 per year for each of four years;
- (c) recipients be selected and scholarships awarded at the division level,

after careful screening by an appropriate committee of the division and without prior review by the national office; and

(d) the national office offer approximately six such scholarships annually, at approximately double the monetary value of the division scholarships, and that applicants for such scholarships be nominated by the divisions.

The Predoctoral Period. The predoctoral period is here defined as the interval between the awarding of an A.B. degree, or its equivalent, and the completion of the requirements for an M.D. or Ph.D. degree. No evidence was brought forth to indicate any need for additional support for predoctoral persons working toward a Ph.D. degree. But, the subcommittee noted with some concern the continuing decline in the number of persons with M.D. degrees who apply for and receive postdoctoral fellowships for training in cancer research, as reflected in the following table prepared by the Committee on Growth.

Year	Applicants			Awards			
	No. M.D.	No. Ph.D.	% M.D.	No. M.D.	No. Ph.D.	% M.D.	% M.D.
1946-47	20	21	48.8	9	7	56.2	
1947-48	34	16	68.0	15	10	60.0	
1948-49	54	25	68.4	14	10	58.3	
1949-50	57	24	70.4	17	6	74.0	
1950-51	83	44	65.5	13	12	52.0	
1951-52	45	52	46.3	30	28	51.7	
1952-53	37	47	44.4	22	24	47.8	
1953-54	35	58	37.6	17	27	38.8	
1954-55	40	69	36.7	14	36	28.0	
1955-56	43	101	30.0	13	40	24.5	

Unquestionably this undesirable trend is the result of many factors. Some of these influences will be alluded to in a subsequent section of this report; but at this juncture the committee would express its view that an effective way to increase the relative number of M.D.'s in cancer research is to provide opportunities for these persons to participate in cancer research at an early period in their medical training before they have become irrevocably committed to clinical practice.

In this connection, the American Cancer Society has been requested to finance a program of summer fellowships for medical students so as to provide certain of these persons with opportunities to participate in cancer research prior to the time they receive an M.D. degree. After careful study, the committee concluded that whereas it would wholeheartedly support the declared objective of the plan, it did not believe that the results of the fellowship plan proposed would justify its cost. In the first place, it is believed that the terms of the predoctoral fellowship would seldom allow for providing a student with a sufficiently stimulating experience to induce him to undertake a career in cancer research. And, in the second place, through project grants for cancer research, NCI teaching grants and ACS institutional research grants, the medical schools already have available large sums of money which they can properly expend to provide medical

students with any experience in cancer research for which the students have the time, desire and ability. For this reason, it is suggested that the American Cancer Society refrain from instituting any formal program of summer fellowships for medical students. But, in the hope of inducing more M.D.'s to enter cancer research, it is recommended that the American Cancer Society undertake to encourage the faculties of medical schools to better inform their students of the many opportunities they have to profitably devote their free time to scientific investigations on cancer.

The Postdoctoral Period. For purposes of discussion, the postdoctoral life of a scientific investigator may be divided into the following stages: (1) Postdoctoral training, during which he learns the methods and techniques of research, and sees opportunities for pursuing productive work; (2) Scientific adolescence, during which he begins to undertake independent research in an effort to become established in some particular field of scientific investigation; and (3) Scientific maturity, during which he works more or less productively on some problem or series of problems; and, as he grows in stature, begins to attract and train a group of young investigators.

Many of the fund-granting agencies have awarded grants to support investigators in each of these different stages in his development. In particular, the American Cancer Society has expended a very substantial sum of money to support the early postdoctoral training of a sizeable number of scientific investigators through use of such devices as Grants for Research, Fellows and Scholars. But, the American Cancer Society—like most of the other large fund-granting agencies—has looked, with only limited success, to our institutions for higher learning to provide the required number of suitable positions to support these many newly-trained investigators during the period of their scientific maturity.

In this connection it should be pointed out that the persons who the American Cancer Society might interest in pursuing productive research on cancer have just completed long, exacting and expensive courses of training. Most are in their late twenties by the time they have obtained an M.D. or Ph.D degree. And, having reached that stage in life when one ordinarily begins to assume the financial responsibilities of a family, these persons are uncommonly aware of their many opportunities for lucrative and satisfying employment outside the field of cancer research. Therefore, one should not expect the more capable of these potential investigators to even consider a career in cancer research unless such employment offers reasonable financial returns and exceptional opportunities for making unique and worthwhile contributions to society. Lesser rewards and opportunities will serve only to attract mediocrity.

Postdoctoral fellowship grants

The prime purpose of postdoctoral fellowship grants is to provide subsistence to young M.D.'s and Ph.D.'s, over a limited period of time, so that they may amplify their previous training and experience to the point where they are able to conduct independent and productive research on some aspect of the cancer problem. It should be emphasized that such grants

are for the purpose of increasing the number of properly-trained investigators, and are not intended to create a reservoir of cheap labor for the conduct of research. Therefore, any research accomplished in the course of a postdoctoral fellowship should be viewed as purely incidental to the fellow's training, and not as a compelling reason or justification for initially making the grant.

A most difficult problem connected with awarding postdoctoral fellowships relates to the fact that in most cases one cannot pursue a career in scientific research without first obtaining a "professorial-type" position in some institution for higher learning. The character of the postdoctoral training required to fit an individual for a suitable position from which he can launch a career as an independent investigator on cancer, will depend upon that person's previous education and experience, the type of research he elects to pursue, and the nature of the position he seeks. In certain cases, it will be advisable for him to undertake some didactic work and to acquire some experience in teaching, in addition to training in the methods and techniques of research. In other cases, the unmet need will be entirely for training in research.

Therefore, it is recommended that applications for postdoctoral fellowship grants from the American Cancer Society include a detailed plan of the nature and cost of the additional training (both research and didactic) that, in the opinion of the fellow's mentor, would properly equip the applicant to pursue research *and* to obtain a suitable position from which he could launch a productive career in cancer research.

Finally, it is recommended that postdoctoral fellowships be granted for the entire period of the required training of the incumbent. But, to insure against wasting funds on the training of an individual who fails to progress as well as might reasonably be expected, it is suggested that payments not be guaranteed for more than one year in advance. It should be a condition of the grant that payments for the second and subsequent years, if any, will be made only after receipt and acceptance of independent statements from the fellow and his mentor that the training is proceeding satisfactorily and according to schedule, and that it is in the best interest of all concerned that the fellowship be continued.

The committee would here point out that persons preparing for a career in clinical research, and also M.D.'s preparing for a career in laboratory research, are subjected to pressures and experience needs that are substantially different from those encountered by persons with a Ph.D. degree. In the first place, the M.D. is constantly subjected to the temptation of engaging in clinical practice which is a far more lucrative career than research. In addition, the M.D. is usually older than his Ph.D. counterpart, because of the longer period of prescribed training, and also because he is much more likely to be required to devote some years to military service. Therefore, the committee recommends strongly that when a postdoctoral fellowship is offered to an M. D., it be the policy of the American Cancer Society that the stipend and other conditions of the fellowship reflect in a realistic manner the unique needs of the M.D., as compared with the Ph.D.

If grants for fellowships are changed as recommended, the potential scientist would be supported during that period of time when he is concomitantly learning the methods and techniques of research and preparing himself for an appropriate position from which to launch a career in research on cancer. It is believed that a capable and properly motivated person would need no further inducement to take the first of the two important steps leading to a career in cancer research.

Grants for additional faculty-level positions for scientists

An additional consideration of great importance in the choice of a career involves an evaluation of the chances of obtaining employment, of the emoluments that may be forthcoming, and of one's opportunities for making significant contributions to society. The recommendations that follow relate to the belief that an important deterrent today to more rapid progress in cancer research tomorrow is the dearth of positions of permanent nature which provide competent scientists with time for creative imagination, suitable compensation, adequate physical facilities and expectant research environments. Therefore, it follows that it is while a potential investigator is contemplating his chances of obtaining suitable employment that the best of the available minds are apt to become discouraged from undertaking careers in cancer research.

The American Cancer Society, together with most of the other fund-granting agencies, has made available a large number of postdoctoral fellowships which provide subsistence to young investigators while they are learning the methods and techniques of research. It has been impossible to determine how many scientific investigators are trained each year. But, some appreciation of the magnitude of the nationwide program of postdoctoral fellowships can be gained from the report of nine fund-granting agencies*. In 1954, these agencies alone awarded postdoctoral fellowships to 571 different persons* to begin training for a career in research in those scientific disciplines only that would make them eligible for positions on the faculty of a medical school. Of this number, 200 were awarded for training in cancer research alone**.

Thus, it would appear that a potential scientist need be little concerned with the possibility of failing to obtain a postdoctoral fellowship to finance his training for a career in research. But, as has been said before, the American Cancer Society—and also most of the other large fund-granting agencies—has looked to our institutions for higher learning to provide the required number of full-time and permanent positions for these many newly-trained investigators.

At the present time there are approximately 250 vacancies among some 4,000 permanent and full-time positions in the medical schools of this coun-

*National Institutes of Health (336), American Heart Association (55), National Foundation for Infantile Paralysis (42), National Science Foundation (3), American Cancer Society (31), Fulbright Awards (26), Commonwealth Fund (18), Life Insurance Medical Research Fund (16) and Rockefeller Foundation (10).

**National Cancer Institute (150), American Cancer Society (30), Damon Runyon Memorial Fund (17), and Jane Coffin Childs Memorial Fund (3).

try. Whereas these vacancies do offer permanent employment, and the incumbent would be encouraged to determine the direction of his own research, many are totally unsatisfactory positions for a competent and aggressive investigator. For example, most of these vacancies provide: (a) relatively limited (in many cases totally inadequate) facilities for research; (b) relatively little time for research, because of heavy service and teaching loads; (c) little or no opportunity to gain the many benefits that stem from daily association with investigators working productively in related fields of research; and (d) totally inadequate salaries. Thus, it is apparent that we have not succeeded in creating the required number of suitable positions to accommodate the scientists now being trained to conduct the vast amount of research in the medical sciences we have elected to pursue.

And, since the number of scientists being trained each year greatly exceeds the number of suitable positions to support them, most of these newly-trained investigators must look for their own salaries to grants-in-aid for research. This mechanism is unsatisfactory in that it not only makes a career in cancer research seem less attractive to the best minds, but it also relegates to the national fund-granting agencies far too much control as to the nature of the research these investigators might conduct.

One should not be too critical of our institutions for higher learning for failure to provide enough suitable positions for the many additional scientists that have been and are now being trained to conduct the vast present-day research effort in the biological sciences. For the most part, these institutions were designed primarily as educational centers, and they have generally succeeded in providing enough suitable positions to discharge their teaching obligations. But with vast amounts of funds becoming available through extramural grants to support research in the medical sciences, these institutions have been placed in the position of being asked to conduct far more research than they had ever anticipated. And, by effecting a tremendous increase in funds to support the initial training of scientists, the fund-granting agencies have placed these institutions in the unfortunate position of being looked to to house a far greater number of investigators than they could justify in relation to their teaching obligations. Moreover, the acceptance of large numbers of extramural grants for research has forced these institutions to expand substantially their physical plants and administrative staffs, and to provide many other and expensive services. In all too many instances these added costs have been met by expending funds intended primarily for educational purposes. And, since research and education cannot be considered as separate and unrelated entities—in that one is essential to the other—the American Cancer Society should be aware that a continuation of this practice cannot but result ultimately in a reduction in the quality of cancer research.

It is believed that the conquest of cancer is and should be a cooperative undertaking between two partners, i.e., the fund-granting agencies and the institutions for higher learning. Currently this effort is less than maximally effective, largely because one member of the team is financially anemic. The institutions for higher learning have found it to be impossible to create

enough suitable positions for the large number of scientists that are needed to conduct the vast amount of research on cancer that the fund-granting agencies have elected to support. Therefore, it is suggested that a realistic solution to this problem requires the fund-granting agencies to help deserving institutions for higher learning to create additional suitable positions for young investigators of exceptional promise. This must be done in the scientific disciplines related to cancer: (a) to assure that the scientists now being trained are able to realize their maximum potential for fully imaginative research, and (b) make a career in cancer research so attractive as to lure the more capable and ingenious of the potential candidates.

At this point one might ask, "What is so unique about scientific research that the scientist requires a permanent position?" As an occupation research is quite dissimilar to production. In the case of a production worker, daily output is usually in direct proportion to the energy expended. But, the scientist, irrespective of his diligence, has his ups and downs; he tends to make false starts and to wander into blind alleys, and his performance consists characteristically of short spurts forward interspersed with relatively long periods when apparently no progress is being made. The threat of job loss can be an effective incentive for a production worker; but in research, an effective incentive for productivity is a permanent position. This, because creative imagination is the *sine qua non* for overcoming a period of nonproductivity; and the prime requisite to creative imagination is leisure time to contemplate and weigh the significance of the many facts, concepts and other intangibles with which the investigator must work.

Therefore, it is recommended that the American Cancer Society make grants to deserving institutions for the purpose of making available additional permanent positions in those branches of the biological sciences that are of importance to cancer research. The following scheme would provide a workable mechanism for effecting these recommendations:

1. A capital fund of approximately \$200,000* is required if both interest and capital are fully expended, to provide suitable compensation for one investigator from age 31 through 65. [The actual amount of the capital sum required would depend upon: (1) the age of the investigator, and (2) the salary scale of the grantee institution.]
2. It is suggested that, to assure a maximum return on the investment, the American Cancer Society appoint a special advisory committee to evaluate the probable worth and promise of the candidates and of the positions being offered by the institutions.
3. It is suggested that applications for such grants originate jointly with

*A capital sum of \$200,675.15 would provide a salary from age 31 through 65, at the rate of \$6,000 for each of the first three years, \$7,000 for each of the next two years, \$8,000 for each of the next two years, \$9,000 for each of the next three years, \$10,000 for each of the next three years, \$12,000 for each of the next five years and \$15,000 for each of the next 17 years. This calculation assumes: (a) an investment return of 4% on a capital sum of \$200,675.15 and, (b) that premiums for retirement and other benefits are paid by the investigator.

In other words, the appropriating of approximately \$200,000 initially would be the equivalent of spending \$420,000 over a period of 35 years to provide the salary of one investigator at the level indicated.

the investigator and the institution. Approval of the application by the institution would denote that: (a) the institution was desirous of increasing, by one, the number of regular and permanent staff positions in a stated department; (b) the institution was satisfied that the applicant was unusually well qualified for this particular position; (c) the institution was prepared to offer this particular position to the applicant; (d) this position would afford the incumbent all of the rights and privileges normally associated with a regular staff position in the institution; (e) subject to the applicant's continued growth and development, he could look forward to regular promotions within the department up to and including the rank of professor, or its equivalent); (f) although the incumbent would be expected to participate in all regular activities of the institution, he would not be assigned such responsibilities for teaching, service and administration as to seriously interfere with his research productivity; (g) the incumbent would be provided with adequate physical facilities for his research; (h) in the event the incumbent resigned or was discharged for any reason, the institution would, within a period of two years fill the position with a person of the institution's choice (subject to the approval of the American Cancer Society), or return to the American Cancer Society its proportionate share of the residue of the capital sum provided for the newly-created position; and (i) the number of permanent positions within the specific department would neither be decreased, nor would the department be assigned additional responsibilities without concomitant increases in staff, during the term of the grant, as a result of this position having been created.

4. It is recommended that the American Cancer Society give favorable consideration only to those requests for grants for additional permanent positions that emanate from dependable and well-established institutions and that propose investigators of exceptional promise. It is suggested that candidates for these positions be required to : (a) have earned an M.D. or Ph.D. degree, or their equivalent, (b) have had at least three years postdoctoral experience in research, and (c) have demonstrated an unusual capacity for creative imagination and for working independently and productively on research applicable to the cancer problems.

5. It is recognized that there are many arguments both for and against creating additional full-time tenurial positions for scientific investigators. For example, some will maintain in opposition to this concept that when one's economic wellbeing is assured, he has less incentive to be maximally productive. But there is also the most convincing argument in support of this concept, which is that nothing less than a permanent position in an expectant research environment will assure society a reasonable return on its investment in the education and training, and in its previous support of the research, of the investigator. The following plan is recommended to the American Cancer Society as a practical solution to this apparent dilemma:

(a) The amount of the capital sum to be established to support each additional permanent position be determined on the assumption that the

incumbent will be given regular promotions up to and including the rank of professor (or its equivalent in the grantee institution), and that each promotion will be accompanied by an increase in salary commensurate with the established practice of the grantee institution.

(b) Promotions in rank are to be at the discretion of, and in accordance with, the established policy of the grantee institution, and may be made at any time. It is proposed that increases in salary are to be made only for meritorious productivity by the incumbent, and that all such increases will be in accordance with the regular practices of the grantee institution and the terms of the grant for the additional permanent position.

Grants for scholars in cancer research

When the program of postdoctoral fellowships was initiated, it was expected that the period of training would end with the completion of the fellowship. It was generally believed that after completing a postdoctoral fellowship, the young investigator would accept an instructorship and/or an assistant professorship in some institution for higher learning, which position would provide support for the investigator during the period of his scientific adolescence. But, as was indicated previously, there are far fewer suitable positions for these persons than had been expected.

The program of scholar grants was instituted largely to circumvent this deficiency. But, as an unexpected dividend, it has been found that a scholar grant actually enables the recipient to mature into a more knowledgeable and productive scientist than would have been the case were he required to obtain his support from an instructorship or an assistant professorship. This is so because: (a) having few or no responsibilities for teaching and service, he is able to devote essentially all of his time to research; and (b) since his salary is already provided, he is free to go to that institution which offers him the best opportunity to become established in the field of research he has selected. Were his income dependent upon a professorial position, he would not only be limited to the institutions where such a vacancy existed, but he would also be required to spend a considerable part of his time in teaching and in service. Thus, there can be little doubt but that scholar grants have enabled exceptionally capable young investigators to gain an invaluable experience in research. In particular, such grants are an effective mechanism for supporting young scientists who are exploring ways to till the uncommonly fertile soil that may be found in the borderline zones between scientific disciplines.

BUT, when one tries to balance the immediate and future needs of cancer research against the available resources for satisfying these needs, it is difficult to justify, until more pressing needs have been met, a sizeable program of scholar grants. For despite the many excellent features of scholar grants, they provide only temporary positions at best. Research on cancer is already plagued by a plethora of temporary positions. A most important unmet need in cancer research today is to increase the number of full-time positions of permanent nature which provide suitable compensation and adequate facilities and stimulating environments for research.

Until this has been accomplished—and it cannot be achieved through scholar grants—one should not expect to induce the best of the available minds to undertake a career in cancer research; nor, once in the field, to achieve anywhere near the maximum of his full potential for imaginative and productive research.

It should be brought out here that scholar grants now serve as the only available bridge, other than grants-in-aid, for spanning the gap between the completion of a fellowship and the finding of a suitable permanent position. Hence, they now serve a most important function. But, if: (a) the American Cancer Society accepts the recommendations of this report for changing the terms of its fellowship grants *and* agrees to make grants to help create additional permanent positions in those branches of science related to cancer, and (b) the National Cancer Institute goes ahead with its plans to make long-term grants for the support of scientific investigators, there will be with time progressively less need for making grants for scholars in cancer research.

Therefore, it is recommended that the American Cancer Society modify its extensive program of scholar grants; limiting such grants to persons who need advanced training but who are assured of a suitable position after completing the scholarship. It is recommended further that the Society discontinue awarding scholar grants according to a predetermined term and salary level, and that the amount and term of all subsequent scholar grants be tailored to the individual needs of each grantee.

* * *

The relative need for grants for fellows, scholars and additional permanent positions is as follows:

(1) Of late there has been, through grants for training and research, such an enormous increase in funds available to support the early post-doctoral training of potential investigators that few, if any, qualified candidates are denied support. And, of the total number of young investigators being trained, only a modest fraction are recipients of fellowship grants from the American Cancer Society.

Therefore, it is recommended that the American Cancer Society restudy the extent of its postdoctoral fellowship program—in light of the magnitude of support for this purpose from other sources—with a view to determining whether a portion of this money might not be employed more efficaciously in creating additional permanent positions for the many scientists already trained.

(2) If grants for scholars in cancer research are limited to persons who have been assured of permanent positions after completing the scholarship, one may then view such expenditures as not too dissimilar to expending funds to create additional permanent positions. Under these conditions, it is recommended that every effort be made to meet the real and unique needs of persons of exceptional promise.

(3) The need to create additional permanent positions for investigators in the sciences related to cancer is both real and urgent. And, there must be a sufficient number of such positions that the young investigator is made

to believe that he has a realistic chance to obtain one for himself within a reasonable period of time. To do less is to run the grave risk of failing to lure into scientific research the best of the available minds.

Nevertheless, and only for the reason that the creation of additional permanent positions is a new and untried venture for national voluntary fund-granting agencies, it is suggested that initially the American Cancer Society be cautious of attempting to create more than five such positions annually.

• • •

Finally, and in connection with making grants to support persons, it is suggested that the American Cancer Society not lose sight of the facts that scientific research is a highly individualistic enterprise, and that discoveries of great practical significance are more dependent upon the quality than upon the quantity of scientific investigators. Therefore, if it is to be assured of a maximum return on its investments, the American Cancer Society should limit its grants for personnel to persons of unusual promise and ability, and adapt the terms and conditions of such grants to the unique needs of each grantee.

Part B: Administrative Machinery

*(As presented to and approved by
the Society's Research Committee on March 14, 1956, and
the Society's Board of Directors on March 15, 1956)*

INTRODUCTION

AN EXAMINATION of the administrative machinery the Society now employs revealed that, as the Society's support of research grew from less than \$1,000,000 annually in 1945 to approximately \$7,000,000 in 1955, the research program became divided administratively and scientifically into a number of more or less independent efforts.

Thus, this year:

\$2,500,000 is being expended for research and training grants, upon recommendation of the Committee on Growth of the National Research Council;

\$2,500,000 is being awarded as Institutional Research Grants on recommendation of the Research Committee of the Society's Board of Directors to 39 institutions and expended in those institutions upon the recommendations of Advisory Committees set up by the institutions;

\$500,000 is being expended for research on lung cancer, upon recommendation of an Ad Hoc Research Advisory Committee to the Research Committee;

\$500,000 is being awarded for Special Purpose Research Grants recommended by the Research Committee upon the advice of sundry Ad Hoc Advisory Committees;

\$1,000,000 is being expended locally for research and training grants by certain of the Divisions of the Society, acting upon recommendation of their own Advisory Committees.

These activities are mostly involved with screening—in the light of funds available—of applications for grants submitted on the initiative of the applicant. The integration of these segments of the research effort has devolved upon the Research Committee although this group was initially constituted to perform the functions of management rather than of scientific evaluation. The Society's total research program would have greater effectiveness if a more fully coordinated attack on the cancer problem could be mounted through a regular appraisal by a competent scientific advisory committee appointed by the Society.

The central principles of the recommendations in this report are (1) that the Society must have continuing authority and freedom of action commensurate with its responsibilities, (2) that in awarding grants for cancer research it is essential to stimulate and select applications so as to support the meritorious and to exclude the unpromising without rejecting the new and unusual, and (3) that the program must have sufficient flexibility to permit prompt and effective action.

The establishment of appropriate administrative machinery is the subject of the following recommendations.

Recommendation No. 1

The Research Committee is constituted for the important task of management. In view of the size and complexity of the Society's research effort, and of the likelihood of its becoming larger, the task of management is becoming heavier. In order that the Research Committee may continue to provide the required leadership, it must rely to an increasing degree on competent scientific advice. The appointment of a scientific advisory council, charged with keeping all facets of the research program under continuing scrutiny, is indicated. This change would not alter the present line of command which vests final authority for making grants in the Society's Board of Directors or its Executive Committee, acting upon the recommendations of the Research Committee. Such a change is calculated to make for more productive investments of funds directed at solving the problem of cancer.

Accordingly, it is recommended that the Research Committee establish a Scientific Advisory Council of, say 15, investigators, representing the various scientific disciplines and administrative skills concerned with present-day cancer research. The council should be assigned responsibility for (1) continually examining the progress and needs of all research on cancer, (2) recommending appointment of standing and, where needed, special* scientific advisory committees, and (3) reviewing grants recommended by all such committees.

Members and the chairman of the Scientific Advisory Council should be appointed by the Research Committee for specified terms of office.

The Scientific Advisory Council should meet with sufficient frequency to enable it to give effective and timely counsel to the Research Committee.

*One such special committee should be the present Ad Hoc Research Advisory Committee on Lung Cancer.

Members of the Research Committee should be invited to attend all meetings of the Scientific Advisory Council.

It is suggested that initially the Research Committee draw heavily upon present members of the Committee on Growth in establishing the Council.** This would provide experienced and able advisors, and would make for a smooth transition from the present operation.

Recommendation No. 2

It is suggested that, with concurrence of the Scientific Advisory Council, the standing scientific advisory committees be the following:

1. Research on the Etiology of Cancer
2. Research on the Pathogenesis of Cancer
3. Research on the Therapy of Cancer
4. Institutional Research Grants
5. Personnel for Research

It is suggested that all standing and special committees be charged with (1) recommending approval or disapproval of applications for grants and (2) evaluating and reporting progress and initiating activity in their respective assigned areas. Each of these committees should meet at least twice a year, more often if indicated, to reduce the interval between the dates of filing of applications and the activation of grants.

It is recommended that each of these subsidiary committees be composed of persons representing the scientific disciplines concerned with the assigned

**The American Cancer Society is pleased to announce that its initial Scientific Advisory Council will include:

Dr. George W. Beadle, Chairman—Term expires August 30, 1960

California Institute of Technology

Dr. Walter J. Burdette—Term expires August 30, 1961

University of Missouri

Dr. Philip P. Cohen—Term expires August 30, 1958

University of Wisconsin

Dr. Howard J. Curtis—Term expires August 30, 1957

Brookhaven National Laboratory

Dr. Harold F. Dorn—Term expires August 30, 1961

National Institutes of Health

Dr. Thomas Francis Jr.—Term expires August 30, 1960

University of Michigan

Dr. Alfred Gellhorn—Term expires August 30, 1960

Columbia University

Dr. Eugene P. Pendergrass—Term expires August 30, 1958

University of Pennsylvania

John M. Russell—Term expires August 30, 1958

The John and Mary R. Markle Foundation

Dr. George Sayers—Term expires August 30, 1957

Western Reserve University

Dr. Howard E. Skipper—Term expires August 30, 1961

Southern Research Institute

Dr. Edward L. Tatum—Term expires August 30, 1959

Stanford University

Dr. Arnold D. Welch—Term expires August 30, 1959

Yale University

Dr. Milton C. Winternitz—Term expires August 30, 1957

National Research Council (Retired), Washington 30, D. C.

Dr. Charles G. Zubrod—Term expires August 30, 1959

National Cancer Institute, Bethesda, Md.

area. Members and chairmen of the committees should be appointed by the Research Committee, upon recommendation of the Scientific Advisory Council, for specified terms of office. It is suggested that initially the Scientific Advisory Council draw heavily upon the present members of the various Panels of the Committee on Growth in establishing these committees.

It is strongly recommended that each subsidiary committee consider applications without relation to availability of funds. These committees should group applications for grants in order of merit. Inherent in this proposed method of operation is the implication that the Research Committee will assume responsibility for devising ways and means to obtain the required funds.

It is anticipated that the Scientific Advisory Council might recommend creating or discharging subsidiary advisory committees to reflect changing needs. For example, it may recommend the appointment of committees responsible for research by certain scientific disciplines or on cancer of specific sites. Or, pending the report of a committee now studying the Society's responsibility for the support of meritorious research in the biological and related physical sciences not patently applicable to cancer, the Scientific Advisory Council might see fit to recommend that advice be sought on this type of research from some organization not connected with the Society, such as the National Research Council or the National Science Foundation.

Recommendation No. 3

The research attack on cancer requires effective liaison between scientists and administrators in research institutions on the one hand and the administrators of fund-granting agencies and their scientific advisors on the other. Such liaison demands the services of an adequate scientific staff. It is recommended that the present staff of the Society's Research Department be augmented.

Recommendation No. 4

It is recommended that all Divisions of the Society concerned with the support of local research employ a standard application form for research grants and that the Society's Research Department be furnished with an informational copy of each application received and informed of the action taken. It is recommended further that the Society offer the divisions the services of its scientific advisory committees for evaluating the scientific merit of applications for grants that may be received locally.

Addendum

The subcommittee has estimated the cost of the administrative machinery recommended in this report. It believes this cost (which includes provision for honoraria) will be little, if any, more than the present administrative budgets of the Society's Research Department and of the Committee on Growth combined. This cost amounts to less than six per cent of the Society's expenditures for research.

(END OF REPORT OF
AD HOC POLICY SURVEY
COMMITTEE)

Report of Committee on Support of Basic Research and of Medical and Educational Centers

THE COMMITTEE on Support of Basic Research and of Medical and Educational Centers* initiated its study by accepting the following tenets as a basis for further discussions:

(1) All fund-granting agencies that support research on specific diseases must rely on two groups of workers to both conduct the requisite research and to apply the results of the research to the control of disease in man. These two groups are M.D.'s and Ph.D.'s in the biological and related physical sciences.

(2) The quality of the research performed and the effectiveness of the application of the results of research to the control of disease is largely dependent upon the training and opportunities for imaginative and productive work of these two groups of persons.

(3) Although the early conquest of the specific diseases of concern to now existent fund-granting agencies will in all likelihood in part result from research apparently irrelevant when initiated, there is no manifest way to determine in advance which basic research will yield important contributions to the ultimate solution of a particular disease. Much of our present fund of knowledge in the medical sciences has been gained by scientists pursuing knowledge for its own sake.

(4) Vigorous and imaginative pursuit of knowledge for its own sake in the medical, biological and related physical sciences by students and teachers alike would assure improved training, growth of knowledge in breadth as well as in depth, and the realization of a vastly more intellectually satisfying career.

(5) The fund-granting agencies that support research on specific diseases have a great stake in a growing breadth and depth of knowledge in the medical, biological and related physical sciences, not only because such

*The American Cancer Society is deeply appreciative of the thought-provoking report of this committee, composed of Dr. Lowell T. Coggeshall, University of Chicago, chairman; Dr. George W. Beadle, California Institute of Technology; Dr. Detlev W. Bronk, The Rockefeller Institute for Medical Research; Dr. Sidney Farber, Children's Cancer Research Foundation, Boston; Dr. Leon O. Jacobson, University of Chicago; Dr. Vernon W. Lip-pard, Yale University; Dr. Colin MacLeod, New York University; Dr. Robert A. Moore University of Pittsburgh; Dr. H. Marvin Pollard, University of Michigan; Dr. Thomas B. Turner, Johns Hopkins University and Dr. David A. Wood, University of California.

knowledge might furnish promising leads to the solution of specific diseases, but also because it would raise the level of our overall knowledge to such a point that we would be better able to project research on specific diseases that is more certain of success.

(6) The improved training of M.D.'s and Ph.D.'s in the biological and related physical sciences, and the improved support of the pursuit of knowledge for its own sake are so inextricably interwoven that they cannot be treated separately.

Report of Committee

Therefore: after extensive discussion, the committee formally adopted the following recommendations:

(1) The committee recommends that, if suitable arrangements can be made, the American Cancer Society award fluid funds to institutions for higher learning that grant M.D. and/or Ph.D. degrees in the biological and related physical sciences, to foster improved training and to stimulate the pursuit of knowledge for its own sake in the medical, biological and related physical sciences; recognizing that through such furtherance of knowledge advances of great significance to cancer may result.

The committee acknowledged that many details of the administration of such funds would need to be worked out. for example, the Society's "No bricks and mortar" policy would need to apply. Moreover, the Society would need to be assured that such grants would be used entirely to augment the institution's present operations in the medical, biological and related physical sciences and not merely be used to recapture other funds now used for this purpose.

(2) After discussion of what proportion of the Society's funds should be allocated for grants of the type recommended, it was voted that the Society consider devoting 10 per cent of its total resources to this purpose.

*END OF REPORT OF COMMITTEE ON
SUPPORT OF BASIC RESEARCH AND OF
MEDICAL AND EDUCATIONAL CENTERS*

Future of the Program

THE AMERICAN Cancer Society's new plan for the support of cancer research, as described in the preceding pages, is now being put in operation. It is expected that the Scientific Advisory Council and its subsidiary scientific advisory committees on research, and the Society's scientific staff, will be organized and operating by late 1956. Soon thereafter the Society will be in a position to receive and act on application for grants.

In many ways the Society's present plan for support of research represents a considerable departure from its previous operations. In this connection I would make the following points:

(1) The American Cancer Society is deeply indebted to the Committee on Growth of the National Research Council for launching in such a sound and far-sighted fashion a program of research that has grown to its present proportions and productivity. Many of the innovations reflected in the reorganized program now being implemented are the intellectual progeny of the members of this committee and of its panels, and of the staff of the committee and council.

(2) It is recognized that many of the details of the revised research grants program herein described remain to be developed, and that the program itself must of necessity be changed from time to time to be kept abreast of developments.

(3) An abrupt changeover to the new plan, with consequent serious disruption of orderly scientific progress, is not contemplated. On the contrary, it is generally recognized that as many as three years might be needed to bring about an orderly transition. It is hoped that the scientific community will show its characteristic understanding and forbearance during this difficult period of transition.

REFERENCE

1. "New Directions in Research Support," *SCIENCE*, Vol. 123:525, 1956.

